

Seat No.: _____

Enrolment No. _____

GUJARAT TECHNOLOGICAL UNIVERSITY
BE SEM-VII Examination-Nov/Dec.-2011

Subject code: 172101

Date: 19/11/2011

Subject Name: Physical Metallurgy -II

Time: 10.30 am-01.00 pm

Total marks: 70

Instructions:

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

- Q.1 (a)** Explain Why? **04**
- i. In TTT diagram Incubation period & transformation time decreases with decrease of transformation temp up to the nose of the curve after that the decreasing trend is reversed with further decrease in transformation temperature. **03**
 - ii. Coarse grained steel has better hardenability than fine grained steel.
- (b)**
- i. For eutectoid steel, describe the mechanism of formation of austenite on heating. **05**
 - ii. Explain why fine grains have high strength & high ductility than coarse grain steel. **02**
- Q.2 (a)** Explain Why? **04**
- i. Hypereutectoid steels are heated to $AC_1 + 30$ deg.c temp for hardening? **04**
 - ii. Patenting helps in two ways to obtain high strengths. **03**
- (b)** Explain the term active nucleus. Name the active nucleus for (i) pearlitic transformation & (ii) bainitic transformation. Give reasons in support of your answer. **07**
- OR**
- (b)** Why austenite to bainite transformation is referred to as intermediate transformation? **07**
Compare the mechanical properties of bainitic structure with those of pearlitic & martensitic structures.
- Q.3 (a)** Explain the mechanism of martensitic transformation in steel. What is the importance of M_f temperature in retained austenite content? **07**
- (b)**
- i. Explain the method of plotting TTT diagram for steel. What is critical cooling rate? **04**
 - ii. What is the difference between TTT & CCT diagram for the same steel? **03**
- OR**
- Q.3 (a)** i) Explain the term hardenability of Steel. What is critical diameter & its importance? Which factors affect hardenability? **04**
- ii) Discuss the mechanism of quenching steel. Which factors are considered for deciding quenching medium? **03**
- (b)** Describe the Jominy End quench method of determining hardenability. **07**
- Q.4 (a)**
- i. Explain the difference between Full annealing & diffusion annealing. **03**
 - ii. Why spheroidizing is done? **02**

- iii. Which types of steels are subjected to spheroidizing. 02
- (b) What is the purpose of tempering? Explain the structural changes during tempering of steel from room temperature to 600°C. 07
- OR**
- Q.4 (a)** Why Induction hardening is done? How depth of hardening varies with frequency? What are the advantages of Induction hardening? 07
- Continued....page.2
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- (b) i. Compare pack carburizing & Gas carburizing processes. Give example of steel which is carburized. 03
- ii. How depth of carburized layer varies with time & temperature. 04
- Q.5 (a)** Explain Austempering & Martempering processes with sketch. 07
- (b) i. Discuss sub-zero treatment. Which types of steel are subjected to sub-zero treatment? 04
- ii. Under what condition sub- zero treatment can not be applied? 03
- OR**
- Q.5 (a)** Write Short Notes :
- i. Austenitic grain size. 02
- ii. Interlamellar Spacing 02
- iii. Hull & Mehl model. 03
- (b) i. What are the advantages of CCT diagram in contrast to TTT diagram? 04
- ii. What is severity of quench? 03
